

Biogeographic significance of the Nullarbor cave mygalomorph spider *Troglodiplura* and its taxonomic affinities

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Abstract

Troglodiplura is now known from three widely separated, southern Nullarbor caves. Notes and illustrations are given of recently collected specimens. The distribution in relation to postulated earlier bioclimatic scenarios is discussed and notes on the biology given. A reassessment of the taxonomic position of *Troglodiplura lowryi* Main concludes that its affinities are with the Diplurinae as recently delimited. The genus has no recognisable close affinity with other known genera of Australian Mygalomorphae.

Introduction

The blind mygalomorph spider *Troglodiplura lowryi* Main was first described from Roach's Rest Cave near Madura, Western Australia (Main 1969). At the time, the spider was of considerable interest because it was one of only three troglobitic mygalomorphs known and the first described from Australia. There are now about 13 or 14 species of troglobitic mygalomorphs described (Gertsch 1971, 1973, 1982) but *Troglodiplura lowryi* Main remains the only known Australian species.

Although a fragmented, incomplete specimen of indeterminate sex, the Nullarbor specimen described in 1969 could be attributed readily to the subfamily Diplurinae (as then defined) of the Dipluridae. Subsequently Main & Gray (1985) described a male specimen from another cave (Cave 5N253 NNW of the Head of the Bight in South Australia). This was also a fragmented specimen and like the holotype the carapace was damaged and the abdomen missing. However the bipectinate tarsal claws and structure of the male sex characters e.g. pedipalp and a spur on the first tibia confirmed the earlier placement in the Diplurinae (as then defined). Main & Gray (1985) discussed the possible relationships of the species in this context but decided it had no close affinity with other Australian genera attributed to the Diplurinae at that time.

Two further male specimens of *Troglodiplura lowryi* have been collected from a third cave, Old Homestead Cave, north of Madura in Western Australia. Again fragmented and with the abdomens missing, these specimens nevertheless retain features which further add to our previous concept of the taxon. Descriptive notes are given, parts of the two specimens are figured and a photograph of a living specimen taken earlier is presented here.

More recently, M R Gray from the Australian Museum has collected several living juvenile specimens and the fragments of seven carcases and/or castes from Cave 5N253.

One of the juveniles subsequently died and notes on it and the fragmented specimens are given here.

Troglodiplura is here redefined, its systematic position reassessed, hypotheses are proposed regarding its biogeographic origins and notes are given on its biology.

Methods

For the scanning electron micrography, the specimen was taken from 70% alcohol, further dehydrated in absolute ethanol and super dried in a critical point dryer; the specimen was then mounted on a stub, gold coated and viewed with a Phillips 505 SEM using a modified Quentron backscatter detector.

A map is given here (Fig 1) showing the approximate locations of the caves from which *Troglodiplura* has been collected.

Abbreviations: AM, Australian Museum; SAM, South Australian Museum; WAM, Western Australian Museum. Measurements are in millimetres; spination in descriptions: v, ventral; d, dorsal; pv, prolatero ventral; rv, retrolatero ventral.

Systematic position and zoogeography of *Troglodiplura*

In his rearrangement of mygalomorph families and genera, Raven (1985) tentatively placed *Troglodiplura* in the newly elevated Nemesiidae into which family he transferred certain non-Australian genera and all those Australian genera (except *Kiama* Main and *Mascord*) previously included in the Diplurinae. However, he suggested at the same time that *Troglodiplura* might alternatively be "the only extra-Neotropical representative" of the Diplurinae (as he there defined the subfamily). Such a South American Gondwanan affinity was similarly suggested for *Troglodiplura* by Watson

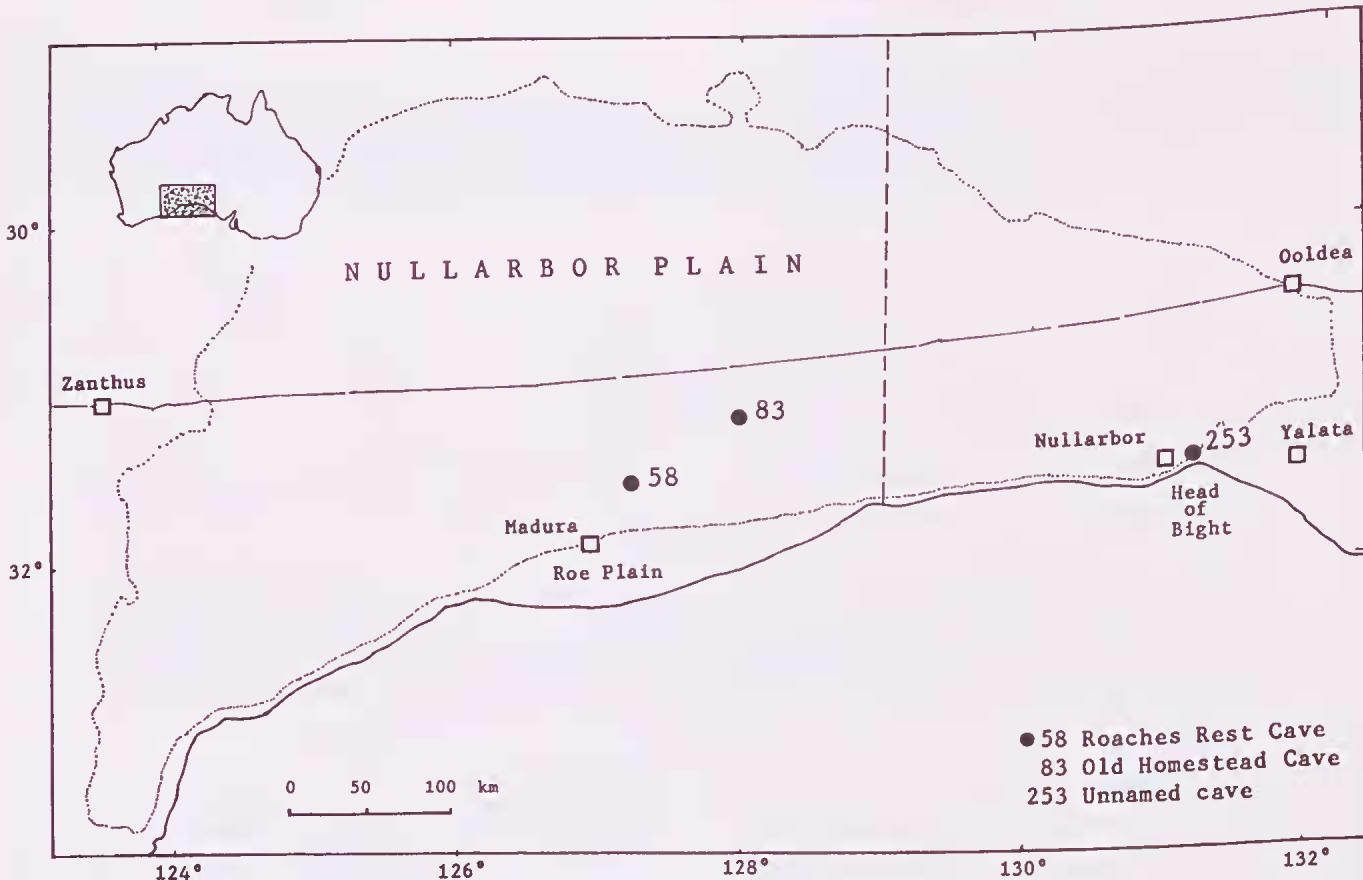


Figure 1. Map of Nullarbor Plain region and approximate location of caves from which *Troglodiplura* has been collected.

et al. (1990). The main definitive features of the Diplurinae noted by Raven (1985) are: bipectinate paired tarsal claws, a single row of cheliceral teeth, and pseudosegmented tarsi in males, "cracked" tarsi in females, and of course, the generalised characters of the family, primarily the low, flat, hirsute carapace and long posterior lateral spinnerets which distinguish diplurids from the Nemesiidae and Hexathelidae.

After further consideration of the Nullarbor specimens (and the photograph by Davey; Fig 2) and in the light of more recent examination of South American diplurines, I now suggest that *Troglodiplura* has closer affinity with *Diplura* Simon, *Linothele* Karsch and *Trechona* Koch [as delimited by Raven (1985) and the only genera he includes in the Diplurinae *sensu stricto*] than with any of the other Australian genera I previously attributed to the Diplurinae (Main 1986) and of which most are now included in the Nemesiidae, except *Kiana* which has been transferred to the Cyrtuchenidae (Raven 1985).

This postulated affinity is based on the following features: the antero-ental position of the maxillary cuspules and the elongated maxillary heel at least in the male (see Main & Gray 1985, their Fig 6), the "cracked" (Raven's term) tarsi i.e. prehensile or strongly arched tarsi (Figs 3 F, J and 4) with tangential lines indicating flexibility (Fig 4), the flat carapace (Figs 3 B, 5 B), and the simple elongate embolus (Fig 5 L-O) and subapical spined spur on tibia I of the male (Fig 3 D and 5 G, H) (see also Main & Gray 1985, their Figs 11-14). Paz & Raven (1990) figured distinctive pseudosegmentation in a female *Linothele*. By comparison, the condition in *Troglodiplura*

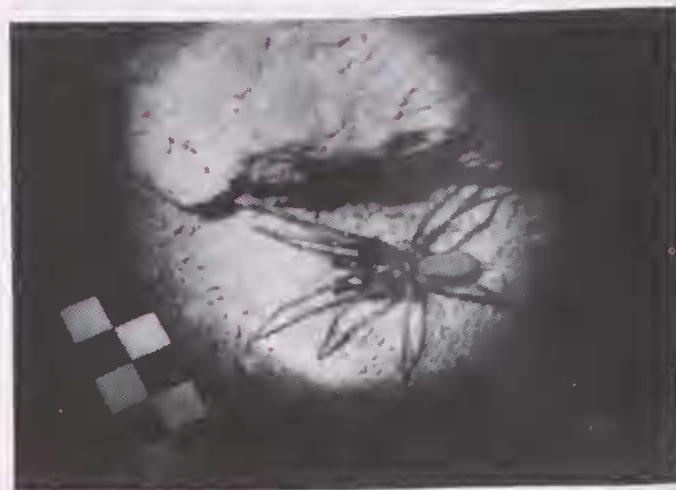


Figure 2. Photograph of torch-lit, live adult specimen of *Troglodiplura lowryi* in situ in Cave 5N 253 (photo by A D Davey, May 1982).

with fewer transverse lines or creases would be defined as "cracked" (see Fig 3, 4A, B) even though Raven (1985, p. 111) referred to it as "pseudosegmented". No adult specimen with intact abdomen has been collected but the photograph of a living specimen (Fig 2) and the juveniles collected by Gray clearly show the strongly arched tarsi (Fig 3 J) and flattened body form characteristic of the *Diplura* group of

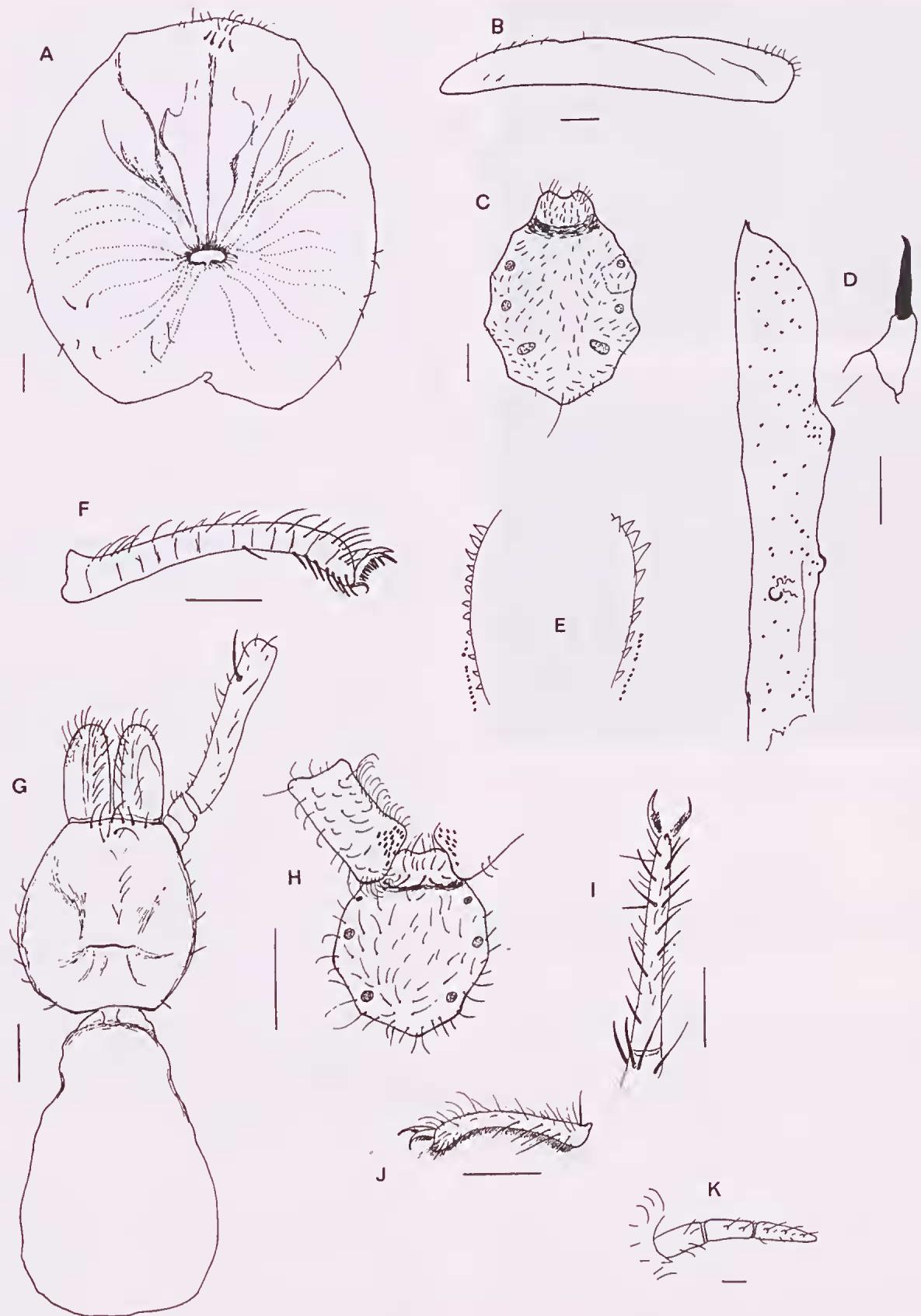


Figure 3. *Troglodiplura lowryi*. A-E, male specimen from Old Homestead Cave (WAM 91/255). A, dorsal view carapace; B, profile of carapace; C, sternum and labium; D, tibia I (right); E, cheliceral groove teeth, right and left chelicera respectively; F, tarsus of holotype; G-K, juvenile specimen (AM, KS30205); G, dorsal view specimen; H, sternum, labium and maxillae; I, tarsus IV ventral; J, right tarsus I; K, left posterior lateral spinneret.

Scale bars: A - D, F - J = 1.0mm; K = 2.0mm; E, not to scale.

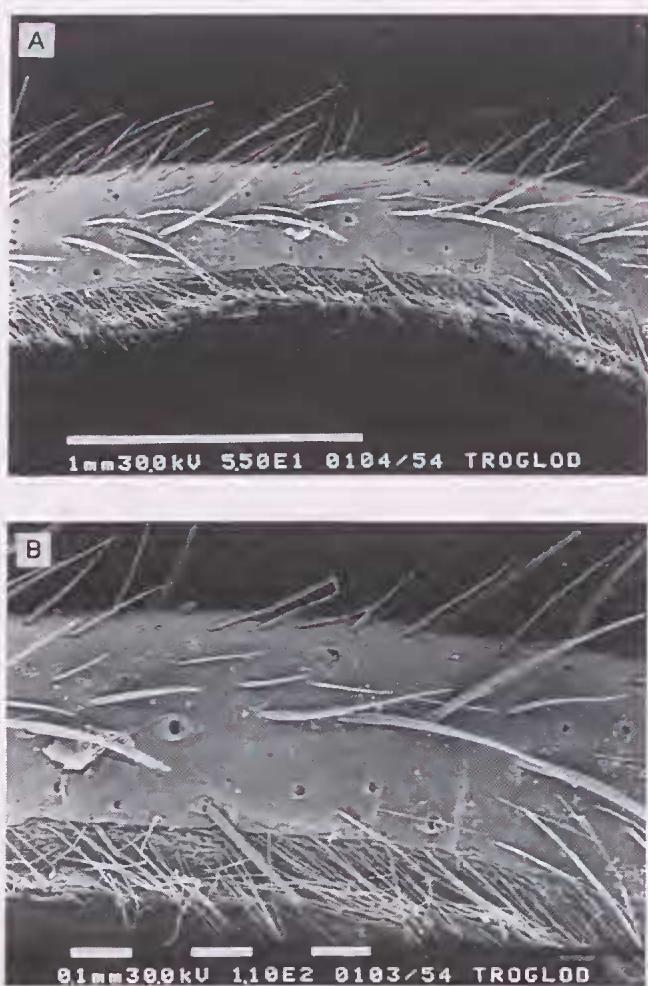


Figure 4. A, B, holotype of *Troglodiplura lowryi*, SEM of tarsus showing faint "crack" lines indicating flexibility.

genera. However the spinnerets although tapering rather than rounded, and projecting well beyond the tip of the abdomen, are not as relatively long as in *Diplura* and related forms.

Nevertheless the general facies of the photographed and collected specimens is unlike that of Australian genera of Dipluridae e.g. Euagrinae, or Nemesiidae. Main & Gray (1985) noted some morphological similarities with *Stanwellia* Rainbow and Pulleine and other genera (now included in the Nemesiidae) e.g. the antero-ental position of the maxillary cuspules in *Stanwellia*, *Ixamatus* Simon, *Xamiatus* Raven and *Anaue kirraua* Raven [although the latter was originally stated by Raven (1984) to have antero-ental cuspules, Raven later (*in litt.*) noted that this species in fact has the typically widespread cuspule arrangement of *Anaue*]. However, of the foregoing only *Stanwellia* has the curved tarsi. In addition *Stanwellia* lacks tarsal spines on the female palp which combined with the flanged embolus suggests affinity with the South African nemesiid genus *Heruacha* Simon.

Although an affinity with nemesiids is unlikely (as discussed above), the taxonomic position of *Troglodiplura* nevertheless remains problematical as several morphological criteria still argue against a true diplurine affinity e.g. the relatively short posterior lateral spinnerets, the non-hirsute

carapace (although this could be expected because of the cavernicolous habit) and the position of the male tibial spined spur which is sub-apical not terminal on the segment.

Clearly the evolution of the nemesiid genera has been independent to that of the *Diplura*, *Linothelae*, *Trechona* complex and possibly stems from an African element of a Gondwanan radiation rather than South American. If this is so, and if we accept a diplurine and thus South American affinity for *Troglodiplura*, then this genus is arguably more recent in its isolation in Australia than that of the nemesiid genera. Such a hypothesis further suggests a parallel zoogeographic occurrence of *Troglodiplura* with the Actinopodidae (*Actinopus* Perty and *Plesiolenia* Platnick and Shadab in South and Central America and *Missulea* Walckenaer in Australia) (see Platnick & Shadab 1976; Goloboff & Platnick 1987; Main 1976 p.260 & 1991).

Systematics

Troglodiplura Main

Troglodiplura Main, 1969: 9. Type species by monotypy, *Troglodiplura lowryi* Main. Raven, 1981: 340. Main & Gray, 1985: 154. Main 1985: 39. Raven, 1985: 111.

Revised diagnosis

Eyes absent. Low, broad, almost flat carapace with sparse hairs. Fovea straight or pit-like. Sternum broad, sigilla small, away from margin. Labium broad, anteriorly indented. Maxillae with pronounced heel and antero-ental cuspules, no serrula. Chelicerae with large teeth on promargin only of groove but with basal or short proximal row of small granule-like teeth on retromargin. Paired tarsal claws with double row of teeth, median claw long, unarmed; tarsal claw of palp with promarginal line of teeth only. Tarsi curved (arched) and with indications of pseudosegmentation (i.e. "cracked"). At least some tarsi (fourth) ventrally with fine spines or spine-like bristles. Tarsal organ low. Trichobothrial base corrugiform on one half only of base (see Main & Gray 1985, their Fig 18). Spinnerets only moderately long (Figs 3 K and 4). Male tibia I with spur bearing a large single spine in distal third; several additional spines. Palpal organ of male with tapering embolus continuous with bulb (Fig 5 L-O). Tarsal lobes of male palp not markedly assymmetrical (Fig 5 J, K). Female internal genitalia unknown.

Comments

Raven (1985) made the following erroneous statements regarding *Troglodiplura*, counter to the original description by Main (1969) and features of the holotype; "Fovea unknown"; "Sternum unknown"; "Tarsi of females...". Main (1969), in her description of the holotype stated the fovea was "straight", and included figures and descriptions of it and the sternum (Main 1969, her Fig 1 A, B). Raven's statement regarding the tarsi of "females" is clearly in error unless his assessment (which would have been unfounded) of the holotype was that it was a female contrary to Main's assessment that it was of indeterminate sex. Raven (1985) was further inconsistent when he distinguished *Spelocutieza* Gertsch from *Troglodiplura* by the "domed apical segment of

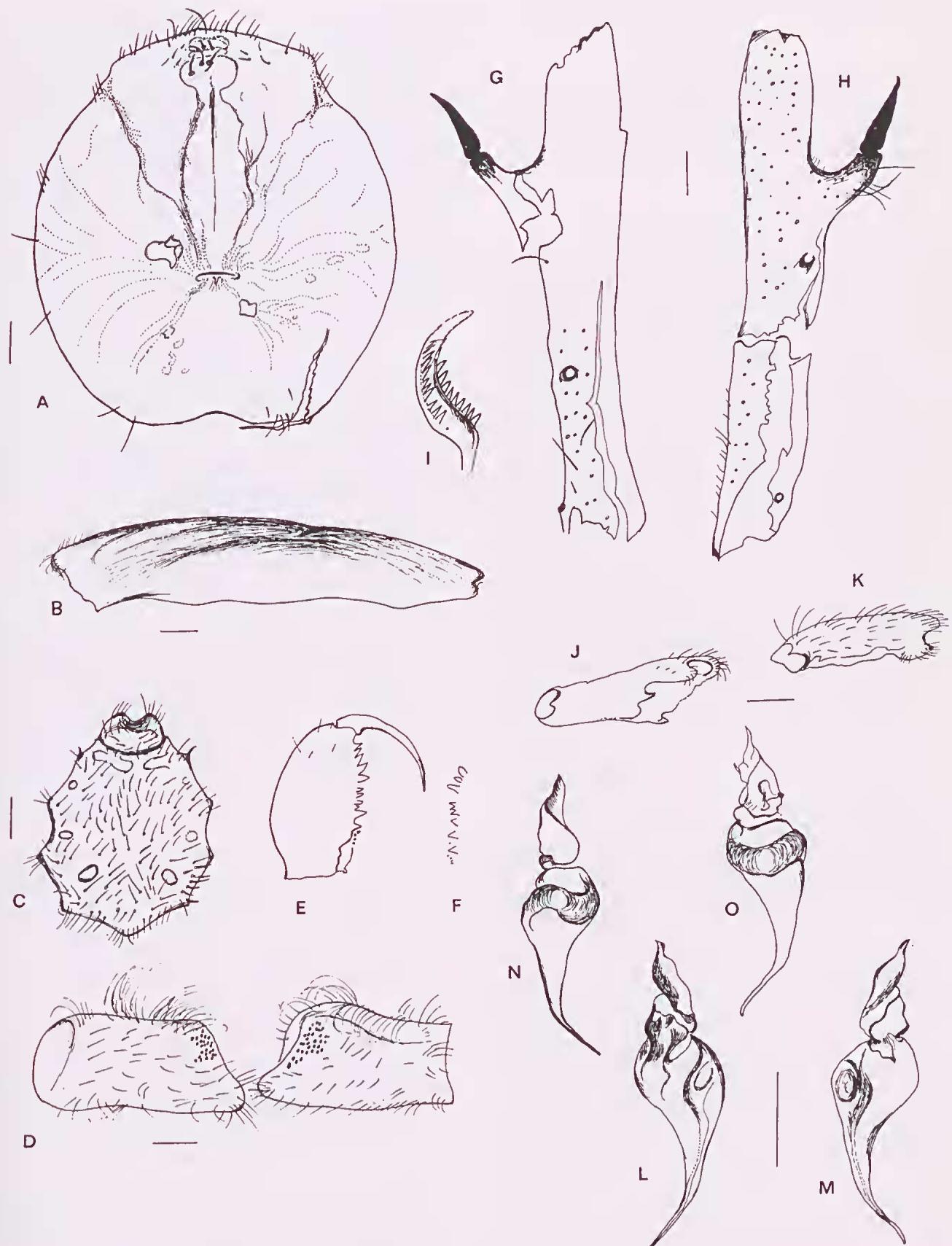


Figure 5. *Troglodiplura lowryi* male from Old Homestead Cave (SAM). A, dorsal view carapace; B, profile of carapace; C, sternum and labium; D, maxillae; E, F, cheliceral groove teeth promarginal aspect (E, left, F, right chelicera); G, tibia I (left ? leg); H, tibia I (right ? leg); I, a paired tarsal claw; J, K, palp tarsus (left ?) proventral and prolateral aspects; L-O, bulb and embolus (stigma) of palp; L, N, right ?, pro and retrolateral aspects; O, M, left ? pro- and retrolateral aspects.

Scale bars: 1.0mm; E, F, I not to scale.

the PLS" yet he stated (correctly) "spinnerets unknown" of *Troglodiplura*.

Troglodiplura lowryi Main

Troglodiplura lowryi Main, 1969: 9. Main & Gray, 1985: 156. Raven, 1985: 81, 111. [Catalogue references not included].

Comments

There is no marked difference in the male characters (palp, tibia I) of specimens from widely separated localities. Although there is no evidence based on known configurations of the caves of a present continuity this does not preclude possible (albeit unlikely) tenuous connections which would allow gene flow between populations. Alternatively the cave populations may have resulted from several independent entries of a former widely distributed albeit scattered epigean species. In that selective pressures would have been very similar for all cavernicole, any morphological and reproductive distinctiveness would have been minimal. Thus, based on present evidence, the three known populations represented from Roaches Rest, Old Homestead and Cave 5N 253 are assumed to comprise a single species. Nevertheless it is noteworthy that the Nullarbor troglobitic araneomorph *Tartarus*, which was formerly regarded as a monotypic genus, now has four species attributed to it (Gray 1992). Thus further study, including possibly genetic analyses may indicate several species of *Troglodiplura*.

Notes on additional specimens of *Troglodiplura lowryi*

(1) Male specimen, fragments. Old Homestead Cave (6N 83), Western Australia, [50 Metres past RDF point], 5 April, 1986, G Pilkington. SAM.

Fragments include an entire carapace and sternal area, both maxillae and chelicerae, tarsus of left (?) palp and bulb/embolus of both palps, leg fragments including tibia of both first legs and some tarsal claws (Fig 5 A-O). The carapace is low, slightly convex but without a "raised" caput, cuticle with reticulated pattern and almost hairless; length 12.00mm, width 10.8 and height 2.4 at fovea, 2.5 at mid caput; group of bristles at "ocular" area; fovea pit-like. Sternal length/width respectively 5.4/5.0, labium length/width 0.9/1.8, covered with dense fine bristles. Maxillae 4.6 long, with pronounced heel and about 45 small antero-ental cuspules. Chelicerae with large, irregular teeth on promargin, 10 (left), 9 (right) and granule-like intermediate basal teeth. Tibia I with large spine-bearing spur in apical third of segment and three spines. A damaged tarsal claw (Fig 5 I) with mid keel and 9 teeth in each row. Palpal organ with broad bulb, not distinctly demarcated from embolus which is "bent" and tapering. Palp tarsus with symmetrical terminal lobes.

(2) Fragments of male specimen. Old Homestead Cave, Western Australia, [6N 83, North Cave b/w RDF Stations "D" and "F" approximately 2 km into cave (in dark zone), Ref. No. 1290-21], 23 December 1990, A Clark. WAM 91/255.

Fragments comprise: carapace (Fig 3 A, B), sternal and labium (Fig 3 C), chelicerae (fangs detached) (Fig 3 E), 2 leg coxae (part), one first tibia (damaged), spur detached (Fig 3

D), genital-covering area of abdomen. Carapace length 11.1mm, width 10.6, height at fovea and front margin 1.7, at mid "caput" 1.9. Sternal length 6.0, width 5.2. Cheliceral teeth, promargin 12 (right), 10 (left), basal outer/intermediate 12 (right), 11 (left), extending to proximal third tooth on promargin.

(3) Juvenile collected alive, died subsequently. Cave 5N 253 Nullarbor Plain, South Australia, [Field no. 285], 11 July 1991, M R Gray. AM, KS 30205.

As this is the only complete specimen ever obtained it is described in detail although a juvenile. (Fig 3 G-K and Table 1).

Table 1.

Troglodiplura lowryi juvenile specimen (AM KS30205) leg measurements.

Leg formula = length of leg divided by carapace length. Tibial index = width of patella X 100 divided by length of tibia + patella (Petrunkevitch 1942).

| Leg formula: | 4 | 1 | 2 | 3 | | |
|--------------|-------|-----|-----|-----|-----|-------|
| | 5.06 | 4.5 | 3.8 | 3.9 | | |
| | Femur | Pat | Tib | Mt | Ta | Total |
| I | 4.0 | 1.9 | 3.7 | 3.2 | 2.1 | 14.9 |
| II | 3.5 | 1.4 | 2.9 | 3.4 | 1.5 | 12.7 |
| III | 3.3 | 1.2 | 3.0 | 3.6 | 1.9 | 13.0 |
| IV | 3.8 | 1.4 | 4.3 | 4.9 | 2.3 | 16.7 |
| Palp | 2.7 | 1.3 | 2.3 | - | 2.4 | 8.7 |

Width of patella I at knee = 0.5. Tibial index = 9.1

Width of patella IV at knee = 0.5. Tibial index = 8.77

Condition of specimen good although cuticle contracted and legs with some segments collapsed and folded stiffly under body. Pale tan colour, chelicerae darker than carapace and appendages, abdomen with integument pulled away from dorsum and spinnerets extruded as though specimen was about to moult. Carapace (Fig 3 G) length 3.3, width 3.0; with a line of bristles along anterior margin of carapace and a group of four bristles at "ocular area" (eyes absent). Fovea broad and straight. Cervical area slightly elevated. Sternal plus labium (Fig 3 H) length 1.8, width 1.5; uniformly cov-

ered with long fine bristles of even length. *Maxillae* with antero-ental cuspules extending along at least half length of inner edge, 20 (right maxilla) 23 (left, of which two are proximally isolated). *Sigilla* small, round, indistinct and close to the margin. *Chelicerae* long, projecting, no rastellum or apical spines; dorsally with longitudinal band of long bristles on inner edge; promargin of groove with 9 teeth, the two proximal teeth separated from others, retromargin 8 (left) 7 (right) basal teeth, retromarginal line extends to third proximal tooth of promargin. *Legs*. Dimensions (see Table 1). Tarsus I (Fig 3 J) and II distinctly curved, others less so (see Fig 3 I, tarsus IV). Tarsus of left palp slightly curved but possibly a shrinkage artefact. Fine ventral spines on tarsi III and IV, 7 or 8 on IV. Metatarsus III and IV with a comb-like apical pair of spines. *Scopula* complete on palp tarsus, tarsi and metatarsi I and II, sparse and incomplete on tarsus and metatarsus III and absent from leg IV. *Trichobothria* absent (?) from palp tarsus, one only on tibia; long and numerous on leg tarsi and metatarsi, longer on posterior than anterior legs (length up to 1.7 mm on metatarsus IV); about 12 in irregular line on tarsus I, few (3 or 4 plus some short trichobothria) on other legs, 11 to 15 on metatarsi and 12 to 15 (double row) on tibiae. *Spination* Palp-Tarsus 0, tibia v 3 apical 2 sub-apical. Leg I-Tarsus 0, metatarsus rv 1 median rd line of about 12 bristles above scopula, tibia rv 1 delicate spine in apical third, femur pd 1 apical. Leg II-Tarsus 0, metatarsus v pair proximal bristles. Leg III-Tarsus v about 15 delicate spines, metatarsus pv / rv 13 d apical pair, tibia pv / rv about 7 spine-like bristles, femur d 1 median. Leg IV-Tarsus v about 18 delicate spines, metatarsus pv / rv about 16 d apical pair, tibia pv / rv about 7 fine bristles and spines, femur d 1 median. *Tarsal claws*, palp with 5 promarginal teeth, tarsus IV with about 10 teeth in each row of both paired claws, inner rows more distal than outer rows. *Spinnerets* not excessively long, much shorter than abdomen and with few spigots (Fig 3 K); dimensions of posterior lateral spinnerets, basal segment 0.5, median 0.4, terminal 0.6.

Seven additional specimens (listed below) were collected dead from the same cave as Specimen (3), all were fragmented and none was complete.

(4) Fragments of carcase, female. Same data as for specimen (3), M R Gray field note 2851. (AM).

Carapace low, length 11.36, width 9.9. Deep straight fovea. Sternum length 4.9, width 4.5. Chelicerae with 9 (right), 10 (left) retromarginal teeth of irregular size. Several leg fragments, one tarsus (IV ?) with fine spines, some tarsi and metatarsi with dense scopulae.

Specimens (5) to (10) same data as (4).

(5) MRG 2853. (AM). Slightly smaller specimen. Cheliceral teeth, 9 (right); scopula on tarsi.

(6) MRG 2858 (AM). Crumpled pieces in a "bolas", possibly a cast skin. Cheliceral teeth 9 (left); scopula on tarsi.

(7) MRG 2857 (AM). Slightly smaller than (4). Cheliceral teeth 9 (right and left).

(8) MRG 2855 (AM). Pulverised fragments.

(9) MRG 2856 (AM). Pulverised fragments, possibly a cast, one curled tarsus identifiable.

(10) MRG 2854 (AM). Male, pulverised fragments, tibia of a first leg identifiable, length 12.7, spined spur in apical third.

Discussion

All specimens collected have been found on the floor of caves. Numerous carcases were reported by A Clark (pers. comm.), the collector of one specimen, to be in Old Home-stead Cave. It is not known whether the spiders make a burrow and/or sheet web. However, if the affinity of *Troglodiplura* is correctly postulated as being with the Diplurinae (as now delimited by Raven (1985)) and as inferred by Raven (1985), and Watson *et al.* (1990) e.g. "probably belongs to a group of primitive web-weaving genera otherwise found only in South America", then the spiders would be expected to build a sheetweb with possibly a tubular retreat extending back into crevices or a shallow burrow in soil or debris. If indeed webs are sited in crevices, they could have escaped detection by speleologists or have been dismissed as webs of Araneomorphae e.g. *Tartarus* Gray, which is known to occur in many Nullarbor caves. Alternatively the spiders could simply spread a film or mesh on the substrate which would be enough to entrap crawling insect prey. The strongly curled anterior tarsi could be used either to probe on the bare substrate or pluck a flimsy sheet-in either case then they could be somewhat analogous to the prehensile claws of the *Gradungulidae* which includes wandering and web weaving species. A reduced web or absence of such could account for the associated "atrophied" or shortened spinnerets.

Observations by M R Gray (pers. comm.) on specimens in captivity (specimens from Cave 5N 253) suggest that no web is made. Gray also observed spiders grasp and bite prey which they encountered while slowly wandering. Similarly spiders *in situ* (Cave 5N 253) were found either under rocks or wandering on the cave floor.

Gray also observed carcases (and collected fragments of seven) which may have been washed together near a wall of the cave. Gray noted that the cave was energy rich and wet (pers. comm.).

The 5N 253 cave system may receive drainage from the Yalata Swamp area to the east. This vast low-lying area of saucer-like depressions, with shrubby chenopodaceous plants, fills intermittently with fresh water. I have collected flood-adapted nemesiid spiders in the area. The whole area *i.e.* Head of the Bight is also subjected to onshore fogs throughout the year including during the summer. That neither of the Western Australian caves have yielded living material is possibly due to progressive drying of the climate with added desiccation due to their greater distance from the coast and thus less surface precipitation and moisture currently draining into the caves.

Presumably ancestors of the spiders originally lived in wet shaded situations amongst vegetation on the surface, firstly (Pre-Miocene) to the north of what is now the Nullarbor Plain and later either on the Plain itself or the northern

boundaries. There is ample evidence of an early-mid Tertiary humid climate prevailing in the Nullarbor region which supported a *Nothofagus*-associated rainforest vegetation, particularly *Phyllocladus*-type representatives. Fossil plant deposits (Cookson 1953, Cookson & Pike 1953, 1954) imply a cool-temperate rainforest type of vegetation across southern Australia and penetrating to the Alice Springs region. Grodzicki (1985) argued that a humid climate was responsible for the karst formations of caves in the Nullarbor and postulated that a subsequent arid climate has been responsible for preservation of the caves while simultaneously causing the peneplanation of the region and erasing the surface drainage pattern which would have been connected to the subterranean system. Nevertheless palaeodrainage lines are still recognisable on the northwestern boundary of the Nullarbor (van de Graaff *et al.* 1977). These drainage lines are interpreted as relics of Cretaceous rivers. Following formation of the "plain" patches of former "rain forest" associated with the terminal sinks of the old rivers (the precursors of the present drainage pattern in which dolines and solution channels have probably formed) could have been scattered across the "plain" and also as "gallery" forests along the northern headwaters of the old drainage courses.

At such a time the archetypal *Troglodiplura* probably made sheet webs amongst the tree buttresses, exposed roots, stones and debris around the butts of trees and rock tumbles. With a drying of the climate, gradual recession of the forest and retreat of water from underground channels formed by earlier percolation beneath a wet forest floor, the spiders could have gradually followed a sequence of habitats from forest floor to cavern-like, semi-epigean nooks in tree buttresses and hollows, retracting finally into deep caves as the surface became completely arid.

Deeleman-Reinhold (1978) in her discussion of the ecology of Linyphiidae in Yugoslavian caves described what had earlier been termed the "microcavernicole" habitat (Racovitz 1907, cited in Deeleman-Reinhold 1978) as a kind of continuum from the forest floor under *Fagus* and other trees to underlying caves common there in limestone. This microcavernicole habitat comprised a network of channels formed by small burrowing mammals in the deep humus and moss of the forest floor. One can imagine a similar scenario on the "Nullarbor" or along its northern boundary during the mid Tertiary when the wetter climate maintained a forest. Lacunae would form naturally in humus and debris by natural decay facilitated by fungi and possibly burrowing reptiles, certainly by invertebrates such as cockroaches, carab beetles, myriapods, orthopterans and spiders (all taxa now represented in caves).

One might query why today there are no known epigean representatives of the Diplurinae in Australia. In south eastern and eastern Australia and Tasmania the Hexathelidae generally fill the same niche and construct sheet webs analogous to those of the Diplurinae of South and Central America. In other parts of Australia the Euagrinae with their curtain webs are role equivalents. Nevertheless such similarity of behaviour and web construction does not completely explain apparent absence of Diplurines. The simplest explanation is that many present forest regions where they might still be expected to occur e.g. Tasmania, were subjected to Pleistocene glaciation. However there is a possibility that relic populations may occur in the northwestern corner

(Smithton region) of Tasmania. The Pleistocene climate was not so severe in this area and it was not subjected to glaciation (Colhoun *et al.* 1982). The Pleistocene ice cap was confined to the central mountains and the periglacial area although extending to mid-western Tasmania did not affect the north western region. Certain burrowing mygalomorphs on mainland Australia overwinter under the snow on mountain tops e.g. Brindabella Ranges in the ACT, Mt Baw Baw and Donna Buang in Victoria (Main 1976, pp. 227-228) so low temperatures as such need not preclude occurrence of spiders. Secondly, suitable rock exposures occur e.g. laminated surfaces of weathered sedimentary rocks for crevice-dwelling web weavers, albeit known to harbour hexathelines (pers. obs.). Even the extreme southwest of Western Australia may harbour relic representatives in suitable sites. Possibly those areas near Denmark where bore samples have revealed early Tertiary floral components (Cookson 1953; Cookson & Pike 1953, 1954) and Nornalup are worthy of further intensive investigation. If (as with several other typically southeastern Australian mygalomorph genera e.g. *Stanwellia* (Main 1990 p. 275)) the spiders are reduced in size where they occur in the less than optimal habitats, then they may have been overlooked in the relatively less mesic southwest forests. Thus these two regions are postulated as the "predictive" areas of occurrence for surviving epigean representatives of the Diplurinae. Only continued searching will test the validity of such biogeographic hypotheses.

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